THE FORAGING SPACE OF ANTS (HYM. FORMICIDAE) IN GREECE.

By W. Pickles.

INTRODUCTION.

During the summer months of the year 1945 observations were made on the activities of ants on an area of ground situated near the sea shore some seven miles south-south-east of Piraeus, the principal port of Greece. The area was flat, very rocky with hardly any depth of soil on it: where there was any soil and between the crevices of the rocks course grass grew in the early months of the year. During the heat of the summer this was completely dried up and much of it blown away by the winds. There were on the area a number of conifers and some of these grew to a good height. In some of these conifers there were nests of ants, other ants nested in the crevices between the rocks in the soil there.

The species of ants which were studied were *Messor barbarus*, L., subsp. *meridionalis*, Er. André, *Aphaenogaster* (*Aphaenogaster*) *testaceo-pilosa*, Lucas, *Camponotus* (*Taenaemyrmex*) *aethiops*, Latr., *Camponotus* (*Myrmentoma*) *keisenwetteri*, Roger, *Cremastogaster* (*Acrocoelia*) *auberti*, Emery, *Cremastogaster* (*Orthocrema*) *sordidula*, Nyl., and *Plagiolepis pygmaea*, Latr. These investigations were carried out from 9th January 1945 to 1st October 1945, when the area was enclosed and access forbidden. There were seven species of ants on the area and much of it was common feeding territory to one or more species. The activities of each of the species will be taken separately.

(a) *Cremastogaster* (*O.*) *sordidula*, Nyl.

Only one nest of this species of ant was observed on the area and records were made from early February until it ceased to exist (3rd May 1945). On the latter date it was then certain that the nest was no longer active. The territory covered by this ant was, as far as could be determined, purely in a horizontal plane, the vertical distribution being negligible. The maximum distance to which this ant travelled was 4 ft., which would give a foraging territory of 50 sq. ft. As there was no record of these ants having a vertical distribution at this site during the investigation it is unsafe to make deductions on their sphere of activity in any but the horizontal plane, although this species was found climbing trees in Algeria, 11th October 1943. At this site in Algeria they also travelled much further from the nest than at this Greek site. Foraging was carried out both singly and in processions in which they collected, amongst other things, the petals of a small plant which resembles a species of ? plantain.

(b) *Camponotus* (*T.*) *aethiops*, Latr.

There were three nests of this species of ant on the area and one of them (No. 10) displayed a great difference in its ecological activities to the other two nests. This nest was under a stone and went down into the ground ramifying between the rocks. The other two nests were beneath the trunks of conifers and the galleries of the nests ramified between the roots of the trees.

The difference in the situations of the nests appears to have had a profound influence on the territory which was covered by the ants emerging from them. The territory of those from nest No. 10 was purely terrestrial whilst the territories of those from the other two nests were chiefly arboreal in distribution.

In the case of nest No. 10 the maximum distance travelled was 24 ft. to a point 23 ft. away. This is very much smaller than the maximum distance travelled by this species in Italy referred to in Pickles (1946c): granted that in the Italian case referred to there were artificial means to help the ants to get from one place to another whilst at this spot there were no such means. In the cases of two other nests which were at the bases of trees the territories were practically purely arboreal. In one of these cases (No. 5), the greatest distance to which the ants travelled from the tree was to a point 16 ft. away, whilst they went to the top of the tree which was 31 ft. high. So that in this case the vertical distribution was twice that of the horizontal. On many occasions the ants were found foraging up the tree solely, there being no foraging along the ground. In both these cases the vertical height to which the ants travelled was greater than the horizontal distance travelled and therefore justifies the three dimensional consideration of the foraging space of ants in contrast to the horizontal distribution solely. It must always be realised that in the vertical distribution there is less freedom of movement as the lines of the processions are limited by the presence or absence of branches in any given direction (*i.e.*, there must be support for the ants).

(c) *Aphaenogaster* (*A.*) *testaceo-pilosa*, Lucas.

On the area of ground under observation, there was one nest of this species of ant. This nest was beneath a stone and went down into the ground and the galleries went along the fissures in the rock beneath the stone. There was evidence that the ants at this site were excavating in the soil because quite a lot of soil excavation took place during the Spring and the Autumn months of 1945—quite a large dump of soil being formed at the close of the survey.

This species of ant seemed to prefer the shady days or the evenings for its activities, as during the summer months it was rarely active during the middle of the day: it would only come out in the evenings. In the early part of the year (March and April) it was abroad during the afternoons also. At this area this species of ant foraged entirely on the ground and the maximum distance recorded was on 27th May 1945. This was 20 ft. 6 ins. This gives a foraging territory of 1321 sq. ft. At this particular area this ant was not seen indulging in arboreal foraging.

(d) *Cremastogaster* (*A.*) *auberti*, Emery.

This species of ant was represented by one permanent nest on the area which later in the summer founded a daughter nest. The parent nest was situated in the stump of the trunk of a conifer which was about 7 ins. high and 8 ins. in diameter. The nest was active throughout the summer months until the stump was chopped down by some Greeks in October 1945. The daughter nest was first recorded on 26th June 1945. This was formed at the base of a small conifer up which ants from the parent nest foraged all summer. This tree was situated some 4 ft. 9 ins. to the north-east of the parent nest.

These ants foraged both along the ground to some low bushes where they attended Aphides and also up the tree already mentioned so that here again we have a case of three dimensional foraging. Although there was a good deal of random foraging there were three permanent processional routes, along which the ants travelled regularly and which remained in existence all through the survey. One was to the tree mentioned above, the second was to the south-west and was 6 ft. long, and the other was in a north-westerly direction, this being 29 ft. long. This was the maximum distance to which ants travelled from this nest on this area. This gives its foraging area as 2643 sq. ft. in extent.

Although there was foraging to the bush continually during the Summer months, the main procession led to the fir tree some 4 ft. 9 ins. to the north of the nest. A regular and well defined procession was usually to be found going to this tree throughout the summer months. There were Aphides on this tree which were being attended by the ants. The height of this tree was 15 ft. 6 ins. Their foraging space in this direction was bounded by the limits of the branches of the tree. The furthest limit of the tree was within the maximum ground foraging distance. This being taken as 29 ft. then the Potential Foraging Space will be 51,101 cubic feet.

The subsidiary nest of this species (No. 4A) at the base of the tree confined its activities to the tree. Ants from this nest would join in the procession from nest No. 4 and go up the tree along with them. Only on a few occasions did the ants from nest No. 4A forage along the ground and then only to a short distance from the base of the tree.

(e) *Camponotus* (*Myrmentoma*) *keisenwetteri*, Roger.

There were two nests of this species of ant recorded on the area; one was near the tree mentioned above in connection with the ant, *C. auberti*, being three feet from the tree and towards the north-east, the other being 29 ft. from the tree towards the south-west.

This ant foraged abroad both along the ground and also up the tree. These ants from the nest near the tree (No. 8) foraged chiefly up it, they made no processions, foraging occurring singly. This tree was also the foraging ground of the ants of this species at Nest No. 9, some 29 ft. away to the south-west. At one time or another they were found on all parts of the tree, so that as with *C.* (*A.*) *auberti* in this direction they did not travel along the ground further than the base of the trunk of the tree which they ascended and travelled along the branches to a point 39 ft. away. This was the greatest distance to which the ants travelled which gives a horizontal feeding territory of 4780 sq. ft. Besides having this large feeding territory, this ant was also found higher up trees other than this tree. At the tree nest No. 7, which was also the site of a nest of the ant *C.* (*T.*) *aethiops*, *C.* (*M.*) *keisenwetteri* was encountered at a height of 18 ft. from the ground; this particular ant was coming down the tree at the time when it was seen and so it had been higher up the tree. So that given the opportunity and the material support necessary this ant was also capable of considerable vertical distribution. We may therefore regard this nest as the centre of a foraging space with the maximum distance from the nest (39 ft.) as the radius. This gives as the Potential Foraging Space 124,288 cu. ft.

(f) *Plagiolepis pygmaea*, Latr.

There was one nest of *P. pygmaea*, this being near the centre of the area. The maximum distance recorded here was less than that found in the investigations carried out on this species of ant in Italy (see Pickles, 1946d).

(g) *Messor barbarus*, L., subsp. *meridionalis* Er. André.

There was one nest of this subspecies on the area near to the centre of the area. The ants from this nest foraged along the ground solely. On 21st April 1945 from this nest there was a procession of ants leading out in a southerly direction for a distance of 37 ft. This was the maximum distance recorded for this species. Although this is an ant of similar size to *Messor barbarus barbarus*, L., its maximum distance was so much smaller than that recorded for the latter species of ant, i.e., 150 ft. This must be due to local factors. As it was never seen up trees this ant has apparently only a horizontal territory. Calculated on the maximum distance recorded this territory is 4303 sq. ft.

TYPES OF NESTS.

Of the species of ants studied in Greece the nests were chiefly ground nests though some of them were situated at the bases of conifers. Details of these nests will be given under each species.

M. b. meridionalis. This species of ant made its nest in the crevices in the rocks filled with soil. They excavated during the rainy season and on several occasions these ants were observed to bring out their seeds from the granaries below to be dried around the mouths of the nests. When they were dried they were returned below.

C. (T.) aethiops. Whereas in Italy these ants were found in stumps of trees used for the support of vines (see Pickles, 1946c) in Greece they were purely terrestrial nests, chiefly situated at the bases of the conifers growing on the area.

P. pymaea. These ants are found in the soil only and beneath stones. On another area not far away from the one we are now considering (see Pickles, 1946b) this species of ants made its nests beneath the pebbles on the sea-shore. In all these cases circular mounds of excavated material were made.

C. (O.) sordiduda. On the area in Greece this species was purely terrestrial, the mounts round the mouth-openings were conical rather than "ramparts" as described by Forel (1928). These small cones were about ¾ ins. in height and several of them had a trackway along which the ants moved, grooved out in the soft soil of which they were made. There may be one or more of these grooves on one cone.

C. (A.) auberti. This species was found in the stump of an old conifer as before stated. The ants were tunnelling in the wood of the stump itself and there appeared to be considerable excavation in the soil beneath the stump. A nursery was found beneath the stone and old needles from the conifers nearby were covering it. The daughter nest of this species at the base of the tree (No. 4A) was, as far as could be ascertained, among the roots at the base of the tree referred to earlier in the text

A. (*A.*) *testaceo-pilosa.* This ant excavated its nest beneath a large flat stone and the excavated material was piled up outside the nest near the mouth opening on the side away from the stone.

C. (*M.*) *keisenwetteri.* Both nests of this species on the area were excavated in the soil and had single mouth-openings. There was no sign of excavated material. Nest No. 8 had no mound at all or even a cone of excavated material, it was just a hole in the ground like that of an earthworm's burrow except that it was of smaller diameter. Nest No. 2 had a cone of excavated material (or rather a pillar of it) with the mouth at the top. There was no groove running down the side as was the case with *C.* (*O.*) *sordidula.* It measured about ¼ in. in height and about the same in diameter.

INTERRELATIONS AND COMMON FEEDING TERRITORY OF THE ANTS.

The ants on this area had much common feeding territory and much of the territory of the other ants was within that of *C.* (*T.*) *aethiops*, and therefore common to more than one species of ant.

Round about the tree near to nest No. 4 there was an area of ground which was common territory to four of the species on the area, i.e. *C.* (*T.*) *aethiops*, *C.* (*A.*) *auberti*, *C.* (*M.*) *keisenwetteri* and *M. b. meridionalis.* These ants with the exception of the latter species were all found foraging up the tree which was near nest No. 4 at one time or another either singly or in processions or one species only or more than one at one and the same time.

The four species appeared to forage on this tree without any quarrels taking place (at least as far as the observations here carried out showed). On several occasions *C.* (*M.*) *keisenwetteri* was up the tree and met members of the nest of *C.* (*A.*) *auberti* when they appeared to avoid each other but there was no real fighting.

At nest No. 7, which was a nest of *C.* (*T.*) *aethiops*, *C.* (*M.*) *keisenwetteri* was observed up the tree even when the inhabitants of the nest at its roots were abroad and somewhat agitated round about the mouth-opening at the base of the trunk of the tree. Again the ants of these two species appear to live harmoniously together, or at least they appeared never to fight during the time that these observations were made. They appeared to avoid each other rather than fight.

GENERAL ECOLOGICAL OBSERVATIONS.

(a) Drying the Seeds.

On several occasions in Greece the ants *M. b. meridionalis* were seen to bring from the nest seeds and these were spread out over the mound outside the nest to dry off in the sun. The harvesting ants are known to do that if there is any danger of the granaries being damp and germination occurring or fungoid growth appearing. But these ants were not seen to make the usual "midden" of waste as was observed in Algeria, etc.

(b) Fights and Quarrels.

Battles between two nests of the ant *C.* (*T.*) *aethiops* had apparently occurred at various times as there were occasions when ants which had lost their abdomens and others decapitated were seen at the bases of the trees beneath which were the nests of this species.

On 11th May 1945 an unusual state of affairs was observed. The ants from nest No. 4 (*C.* (*A.*) *auberti*) were foraging in procession to the tree only. Round about this nest there were several individuals of *C.* (*T.*) *aethiops* behaving in a peculiar manner. They were scraping their heads, jaws, legs, etc., on stones. It was found that heads and thoraces of *C.* (*A.*) *auberti* were fastened to these parts of their anatomy. One of the latter species attacked a *C.* (*T.*) *aethiops* which afterwards went round in circles as if in distress. I watched a specimen of *C.* (*A.*) *auberti* attack one of *C.* (*r.*) *aethiops*: it caught its left middle leg in the tibial region and the latter ant tried to get away from the smaller ant but this was firmly attached to it by by its mandibles. The larger ant tried and tried by rolling, scraping, etc., to get rid of the smaller species but was unable to do so. In the struggle the *C.* (*A.*) *auberti* lost its abdomen; but still it held on with its mandibles. I watched the struggle for half an hour and the larger ant appeared to be weakening through the continued struggling. I was unable to stay longer on this particular occasion, but judging by the number of dead specimens lying about it would appear that this ant finally exhausts itself in trying to rid itself of the smaller ant which has fixed itself so firmly to it and so eventually dies.

(c) FORAGING.

The method of foraging used by *M. b. meridionalis* was to form processions. Of the other species only two produced any points of interest. One was *C.* (*T.*) *aethiops* and the other *A.* (*A.*) *testaceo-pilosa*. Although the former species would forage both in processions and singly, sometimes they would issue from the nest in small numbers. An example of this was on 13th June 1945 when a party of ten workers left the nest No. 10. These ten ants emerged from the nest at 6.45 p.m. They kept in a group for a distance of 18 ft., when they broke up having come across a rock surface 6 ft. long and 2 ft. 6 ins. wide. They went all over the rock apparently wandering aimlessly for five minutes or more before beginning to return to the nest.

A. (*A.*) *testaceo-pilosa*. This species usually foraged singly, but on 24th March 1945 a party issued from nest No. 3 to collect a caterpillar; this account is dealt with fully in Pickles, 1946a.

(d) WIND.

Most of the ants studied in this investigation appear to have been unaffected by the wind. On several occasions *C.* (*T.*) *aethiops* was found foraging to the top of the tree at nest No. 7 even during winds of high velocity. Although these ants were seen to be badly buffeted about on the outer branches, none were observed to be blown off the tree. They were still able to go about their business foraging. 4th July 1945 was a particularly windy day and although I had great difficulty in climbing the tree and the ants were also badly buffeted about, they were able to go to the very top of the tree (26 ft.) without mishap.

SUMMARY.

From the data which have been collected in this survey it would seem that, particularly with some species of ant it is necessary to make observations in three dimensions and so establish a Foraging Space rather

than just a Foraging Territory if we are to get a true picture of their ecological relationships. It would also appear that this three dimensional treatment is chiefly necessary for ants which attend Aphides and therefore tend to climb trees and tall plants. The harvesting ants of the genus *Messor* in particular would appear to keep close to the ground, at least the few inches that they do climb to cut off inflorescences from the grasses, etc., are negligible when compared with the great horizontal distance travelled.

ACKNOWLEDGMENT.

I wish to thank Mr H. St. J. K. Donisthorpe for kindly identifying the ants for me.

REFERENCES.

Forel, A. (1928). "The Social World of the Ants," London.

Pickles, W. (1946a). "The Foraging Activities of the Ant *Aphaenogaster (A.) testaceo-pilosa*, Lucas (Hym. Formicidae)," *Ent. Mon. Mag.*, 82: 4.

Pickles, W. (1946b). "A Study of the Territories of Ants on the Sea Shore," *Ent. Mon. Mag.*, 82: 49-51.

Pickles, W. (1946c). "Studies of the Territory and the Ecological Activities of the Ant *Camponotus (T.) aethiops*, Latr. (Hym. Formicidae)," *Ent. Mon. Mag.*, 82: 220-223.

Pickles, W. (1946d). "The Foraging Space of Ants (Hym. Formicidae) in Italy," *Ent. Mon. Mag.*, 83: 240-243.

A NEW GENUS AND SPECIES OF ANT FROM NEW BRITAIN.

By Horace Donisthorpe, F.Z.S., F.R.E.S., etc.

Subfamily *Myrmicianae*.

Tribe *Tetramoriini*.

Genus *Dorothea*, Gen. n.

Head subrectangular; *clypeus* prolonged between the frontal carinae, posterior ridge of same bordering the antennal foveae; no carina on *cheeks*; no *scrobe* present; *frontal carinae* not very short, nor close together; *antennae* 12-jointed, club 3-jointed; *maxillary palpi* jointed; *labial palpi* jointed. *Thomax* impressed at *meso-epinotal* suture; *epinotum* unarmed. No *spurs* to posterior pairs of tibiae.

Dorothea novobritainae, Sp. n.

Black to blackish-brown, shining; mandibles, scapes, articulations of legs reddish, funiculi and tarsi reddish-yellow. Clothed with longer and shorter fine yellow hairs. *Head* subrectangular, longer than broad, slightly broader anteriorly than posteriorly, posterior angles bluntly pointed, posterior border slightly excised, anterior portion of head finely longitudinally striate, vertex smooth and shining with a few very small scattered punctures; *mandibles* large, triangular, bluntly pointed at apex, masticatory border not armed; *clypeus* convex with anterior border rounded in middle, sinuate at sides, posterior border projecting